Accordingly, it is assumed that this is the entirety of the disclosure that the Examiner is relying upon, because this is the only disclosure in the English language. No translation or other explanation of the document has been provided.

Further, it is noted that 37 CFR 1.104(d)(1), last line, states that "if printed publications are cited, the author (if any), title, date, pages or place, and place of publication, or place where a copy can be found, will be given." However, the citation on the form PTO-892 accompanying the Office Action only states "Russian Article, 1983, No 16, pages 40-46." Thus it may be seen that the citation lacks the author, the title, and the place of publication or place where a copy can be found. As such, because of the improper citation, it is respectfully submitted that the Examiner may not rely upon the reference, and that the rejection must be withdrawn for this reason alone.

However, the following discussion will proceed based upon the assumption that the above defects can be corrected, as well as the previously stated proposition that the Examiner is relying upon the English-language content.

The nature of the present invention has been discussed previously. The present invention relates to a nonlinear optical crystal that is useful as a wavelength conversion crystal for generating vacuum ultraviolet light. In particular, the present invention provides such a crystal that can be obtained through crystal grove.

The invention thus provides a nonlinear optical crystal represented by $K_2Al_2B_2O_7$ (KAB). The KAB crystal can be easily grown using a method such as a flux method according to the present invention.

The KAB crystal can be grown easily by using a flux such as lead oxide, sodium fluoride, cesium fluoride, lead fluoride or potassium chloride.

The KAB crystal can be used as an element for wavelength conversion.

An example of the invention's production is described beginning at line 6 of page 5 of the original specification. As noted at the bottom of page 6, in the evaluation of wavelength conversion characteristic (nonlinearity) of the crystal, when the crystal was illuminated with the fundamental light (wavelength 1,064 nm) of a Nd:YAG laser, the occurrence of light of the second harmonic (532 nm) was confirmed.

The invention is primarily claimed by independent claims 13, 14, 16, 18, 21 and 24.

Independent claim 13 requires a nonlinear optical crystal for generating ultraviolet light, said nonlinear optical crystal comprising a compound represented by the formula: $K_2Al_2B_3O_7$. Claim 14 is a method of making the same crystal, the method comprising growing a nonlinear optical crystal comprising a compound represented by the formula $K_2Al_2B_2O_7$ by a solution growth with a flux that is at least one material selected from the group consisting of lead oxide, sodium chloride, cesium chloride, lead fluoride or potassium chloride.

Independent claim 16 is a method of converting a wavelength for generating ultraviolet light, the method comprising growing a nonlinear optical crystal comprising a compound represented by the formula $K_2Al_2B_2O_7$ via a solution growth with a flux, and illuminating, with laser light, a nonlinear optical crystal comprising a compound represented by the formula $K_2Al_2B_2O_7$.

Claim 18 is a wavelength conversion element comprising the nonlinear optical crystal as recited in claim 13. As recited, the nonlinear optical crystal has an input surface capable of receiving input laser light having a fundamental wavelength, and an output surface capable of transmitting an output laser light having a second harmonic.

Independent claim 21 is a wavelength conversion apparatus for generating ultraviolet light, reciting the wavelength conversion element of claim 18.

Claim 24 is a wavelength conversion method for generating ultraviolet light employing the crystal as recited in claim 13.

All of these claims clearly distinguish over Marnier and the Russian article.

Marnier is directed to a process of synthesis of crystals of the KTP type, i.e. $KTiOPO_4$. As can be seen from the background of this patent, this compound has been shown to have nonlinear optical properties. The patent goes on to describe a flux method for preparing the crystal. The purpose of Marnier is to provide a new process for the synthesis of crystals of the KTP type that can be exploited on an industrial scale and that results in highly-transparent crystals that are especially suitable for applications and optics.

In comparing Marnier to claim 13, initially, it appears that Marnier discloses a nonlinear optical crystal. It is not clear from Marnier whether such crystal is for generating ultraviolet light, however. It is, however, clear that Marnier does not recite a compound represented by the formula $K_2Al_2B_2O_7$.

However, to attempt to cure this deficiency, the Examiner cites the Russian article as teaching $K_2Al_2B_2O_7$ on page 43 thereof.

As noted above thereof, page 43 is entirely in Russian. There is the mention of the formula $K_2Al_2B_2O_7$ on page 43. The only English language portion of this document relevant to this part appears to be the above-quoted discussion which indicates that the recited system can result in the ternary compound having this formula. From this, apparently, the Examiner concludes that it would have been obvious to one of ordinary skill in the art to provide Marnier the compound of $K_2Al_2B_2O_7$ as taught by the Russian article. However, the reference to the Russian article clearly fails to establish a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all of the claim limitations. The teaching or suggestion to make the claimed combination, and the reasonable expectation of success, must be found in the prior art, not in Applicant's disclosure. MPEP §2143; *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

There is no motivation whatsoever in either of the prior art references to make the combination that the Examiner has proposed. Marnier is directed to a process for producing a KTP crystal. It is entirely involved with the discussion of how best to produce this particular crystal. The Russian article is directed to a ternary compound having the recited formula. There is no reason from either document to attempt any modification of the one with respect to the other. The Russian article recognizes no advantage or benefit or, indeed, utility whatsoever, of

the particular formula. Thus there is no reason why one of ordinary skill in the art would have attempted any change to Marnier therefrom.

Further, changing Marnier in the first place does not make any sense. As noted, Marnier is entirely directed toward producing a crystal of one particular type. The crystal of a different type has no relevance to Marnier. Marnier is not directed toward an invention that relates to other crystals, but only the KTP crystal. Thus the Examiner's proposed modification does not make any sense with respect to the disclosure of Marnier itself.

The Examiner cites the obviousness of the modification as being based on "the benefit of a more efficient nonlinear optical crystal." However, the Russian article does not indicate that the $K_2Al_2B_2O_7$ ternary compound is a nonlinear optical crystal in the English language portion therein. Even if this were recognized, there is no indication from the English language portion of the Russian article that this crystal would be more efficient. Even if the Russian article did indicate that this would be more efficient somehow, this is still not a reason to modify Marnier; if Marnier is modified to address a different crystal, Marnier no longer has any meaning, because it is entirely directed toward the production of the KTP crystal.

Accordingly, for these reasons, the Examiner's combination of references must be withdrawn.

Even further, however, even if the Russian article was somehow combinable with Marnier, it is not seen how this would arrive at the present invention. The Examiner concludes that it would have been obvious "to provide Marnier the compound of $K_2Al_2B_2O_7$ as taught by Russian article." If Marnier is so-provided with the compound, however, there is still no indication from either reference of the result. There is no indication from the English language portion of the Russian article that the Russian article sufficiently teaches one of ordinary skill in the art how to produce a nonlinear optical crystal for generating ultraviolet light of the KAB compound. There is no indication from the English language portion of the Russian article that it can be grown with a flux method using at least one material selected from the group consisting of lead oxide, sodium fluoride, cesium fluoride, lead fluoride or potassium chloride. There is no indication or suggestion from the English language portion of the Russian article that the resulting crystal can be used to

convert a wavelength for generating ultraviolet light. There is no indication from the English language portion of the Russian article as to how to produce a nonlinear optical crystal having the recited formula including an input surface capable of receiving input laser light having a fundamental wavelength and an output surface capable of transmitting an output laser light having a second harmonic.

In short, then, the references cited by the Examiner are not established to be enabling for the teachings for which the Examiner uses these references. It should be noted that nonlinear optical characteristics can be lost by differences among symmetry in crystals of the same compound elements and same compositions. For example, there are cases where the nonlinearity changes between high temperature phase and low temperature phase; for example, alpha-BaB_2O_4 has no nonlinearity, and beta-BaB_2O_4 has nonlinearity. There are also many examples where a crystal of the same composition elements as a nonlinear optical crystal does not become a nonlinear optical crystal because of differences in the composition ratios. Thus, there is no basis in the art for being able to predict and consider obvious a nonlinear optical characteristic of a certain compound based on another compound.

In any case, it is clear that the references cited by the Examiner fail to establish a prima facie case of unpatentability. Accordingly, withdrawal of this rejection is respectfully requested.

In view of the above, it is respectfully submitted that the present invention as a whole is now in condition for allowance. Indication of such is respectfully requested.

In view of the above remarks, it is submitted that the present application is now in condition for allowance, and the Examiner is requested to pass the case to issue. If the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact Applicants' undersigned representative.

Respectfully submitted,

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